

# Evolution of Petroleum Development Technology on Alaska's North Slope...

## *Reduced Impacts and Enhanced Environmental Protection*

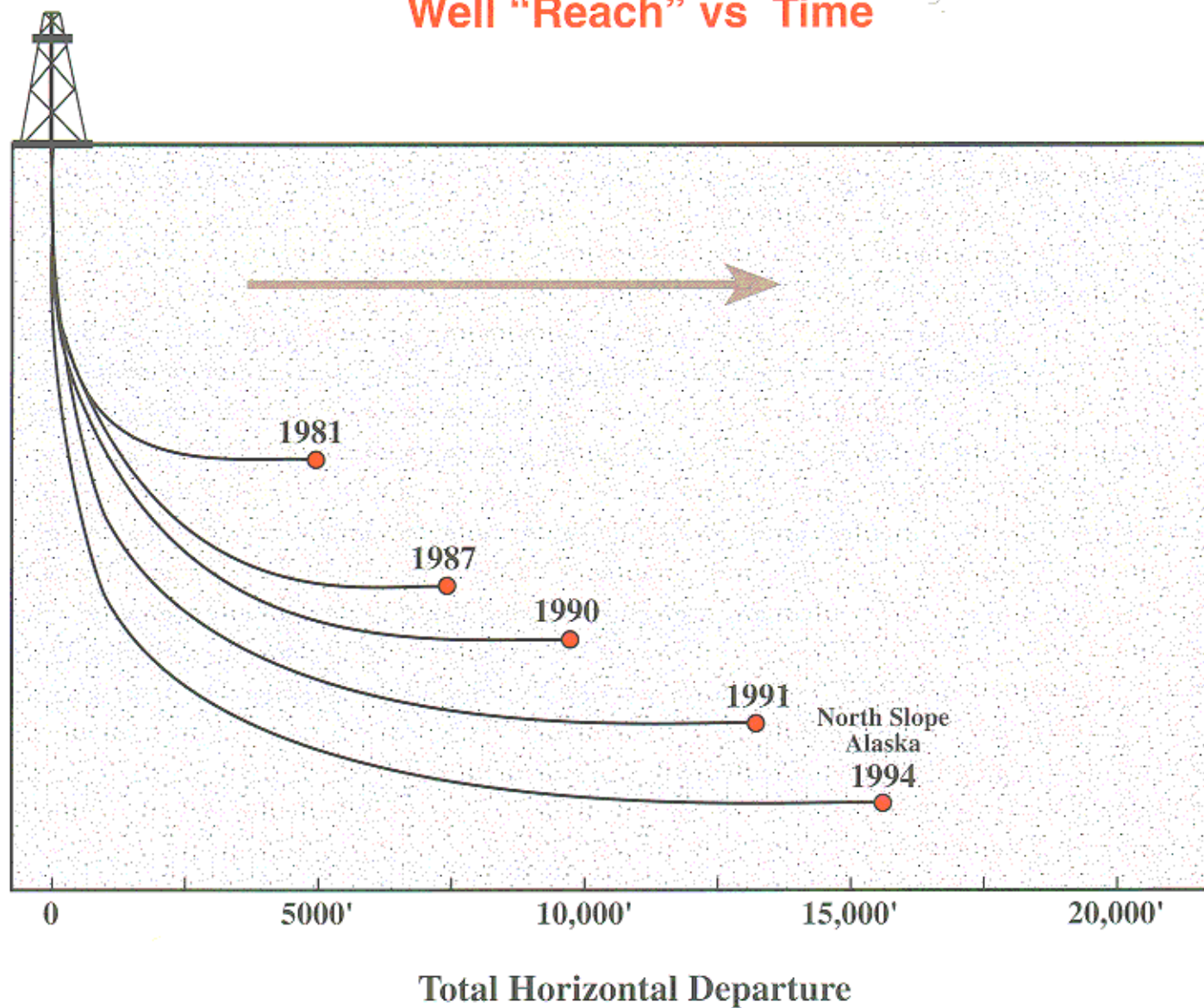


Alaska Department of  
**NATURAL  
RESOURCES**  
Division of Oil and Gas  
June 1995

## **FOLLOWING 20 YEARS OF DEVELOPMENT EXPERIENCE ON THE NORTH SLOPE:**

- SPACING BETWEEN WELLHEADS—**REDUCED 91%**
- SURFACE AREA OF GRAVEL DEVELOPMENT PADS— **REDUCED 76%**
- SURFACE AREA FOR CONTRACTOR SERVICE AREA— **REDUCED 95%**
- GRAVEL ROADS FOR PIPELINE CONSTRUCTION— **ELIMINATED**
- **ICE PADS** USED IN LIEU OF GRAVEL PADS FOR EXPLORATORY WELLS
- **UNDERGROUND INJECTION** FOR DISPOSAL OF DRILLING FLUIDS
- DESIGN AND PERMITTING OF CENTRALIZED WASTE MANAGEMENT FACILITIES — **95% RECYCLING OF ALL ASSOCIATED WASTES**
- **FEWER DRILL SITES NEEDED** DUE TO ADVANCES IN DIRECTIONAL DRILLING
- **RESERVE PITS ELIMINATED** OR NEEDED ONLY ON A TEMPORARY BASIS

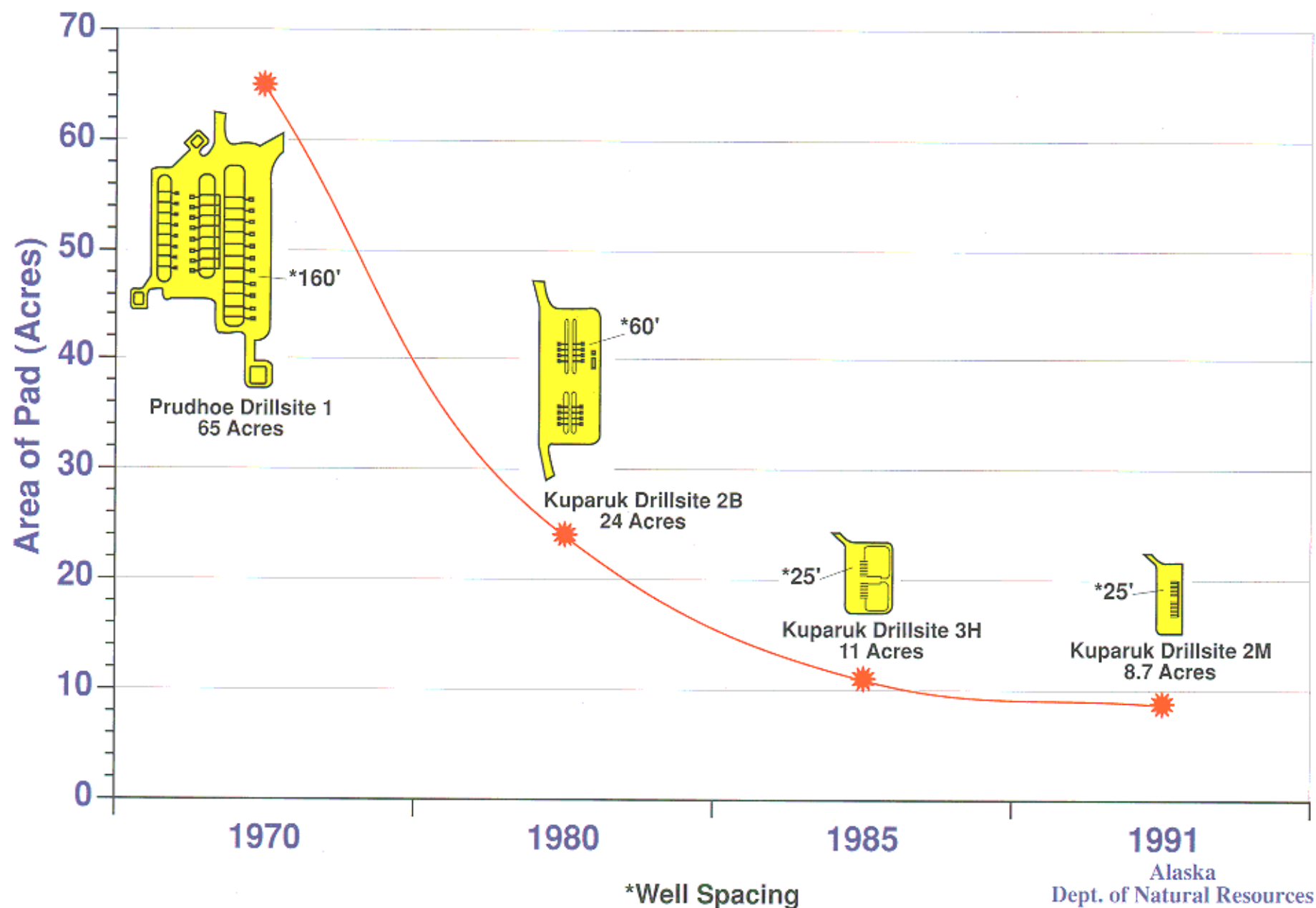
## Well "Reach" vs Time



Graphic Not To Scale

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10-07-94

# Evolving Consolidation of North Slope Production Pad Size



A-Pad: 35 wells, 43.7 acres

1971

WELL PAD A

ACCESS  
ROAD

RESERVE  
PIT

RESERVE  
PIT

RESERVE  
PIT

FLARE  
PIT

RESERVE  
PIT

RESERVE  
PIT

RESERVE  
PIT

WELL

ACCESS  
ROAD

0' 200' 400'  
SCALE

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P-Pad: 21 wells, 10.5 acres

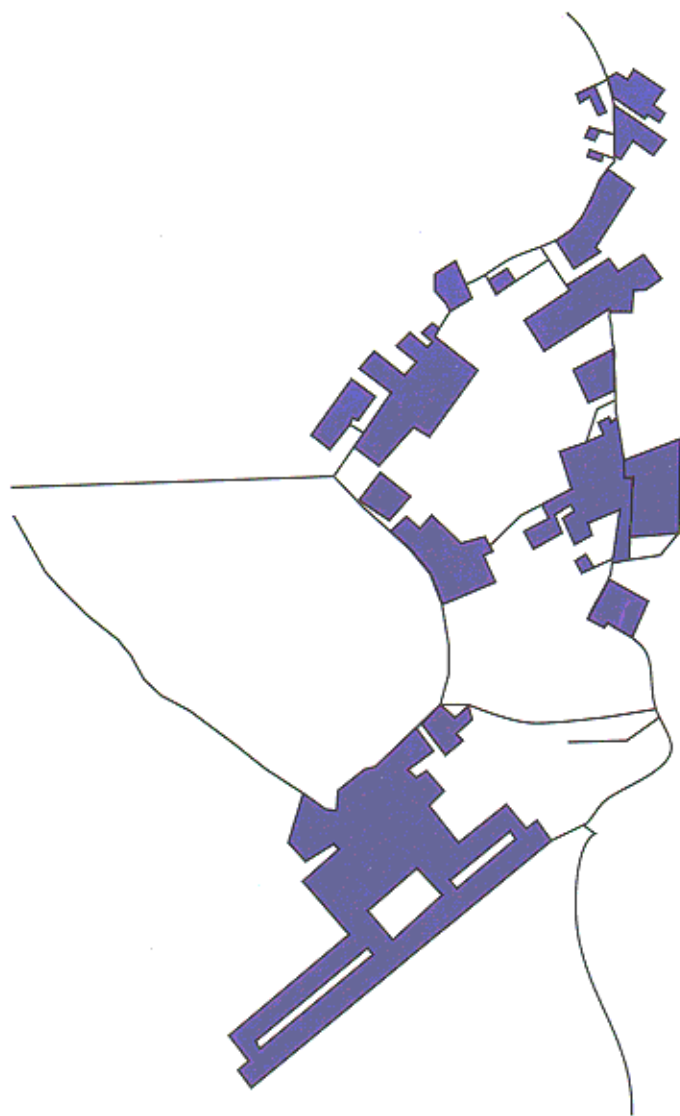
1989

ACCESS  
ROAD

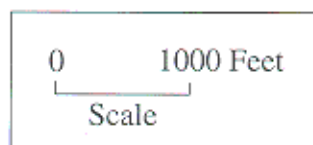
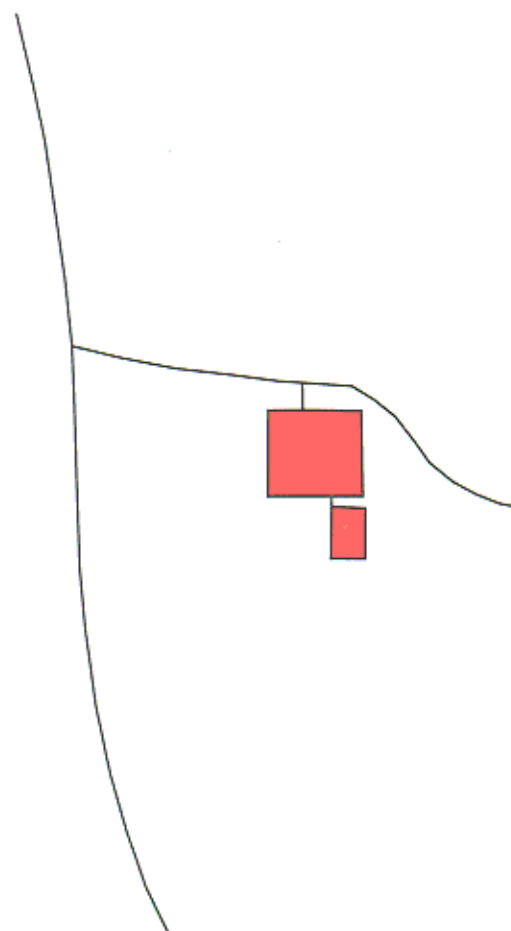
WELL PAD P



## Deadhorse Service Area

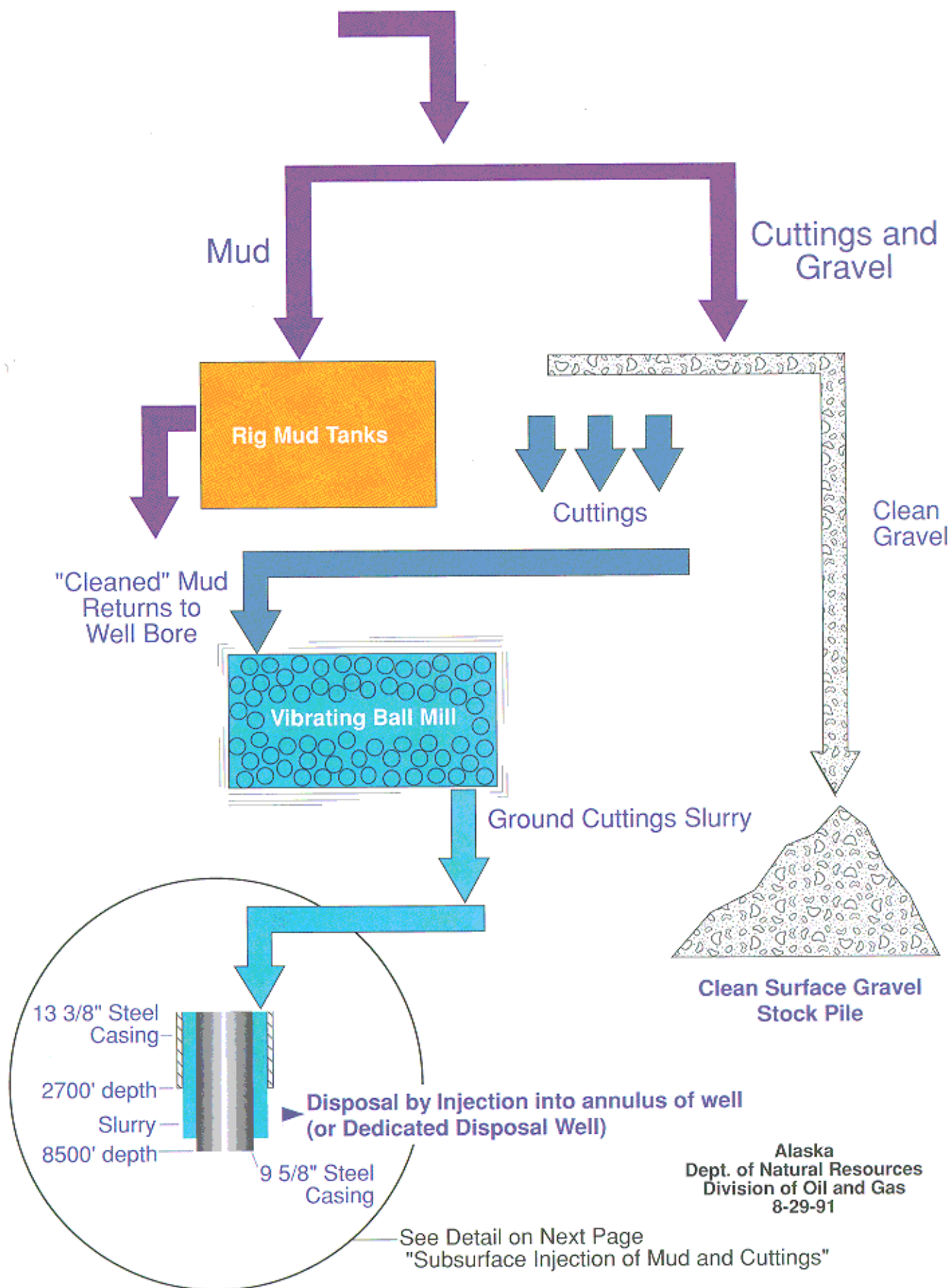


## Conceptual ANWR Service Center



*Service facilities for the Prudhoe Bay oil fields are located at Deadhorse. These buildings are situated on 1,050 acres. Satellite service facilities at ANWR could be located on only 55 acres, as was done for the Kuparuk oil field.*

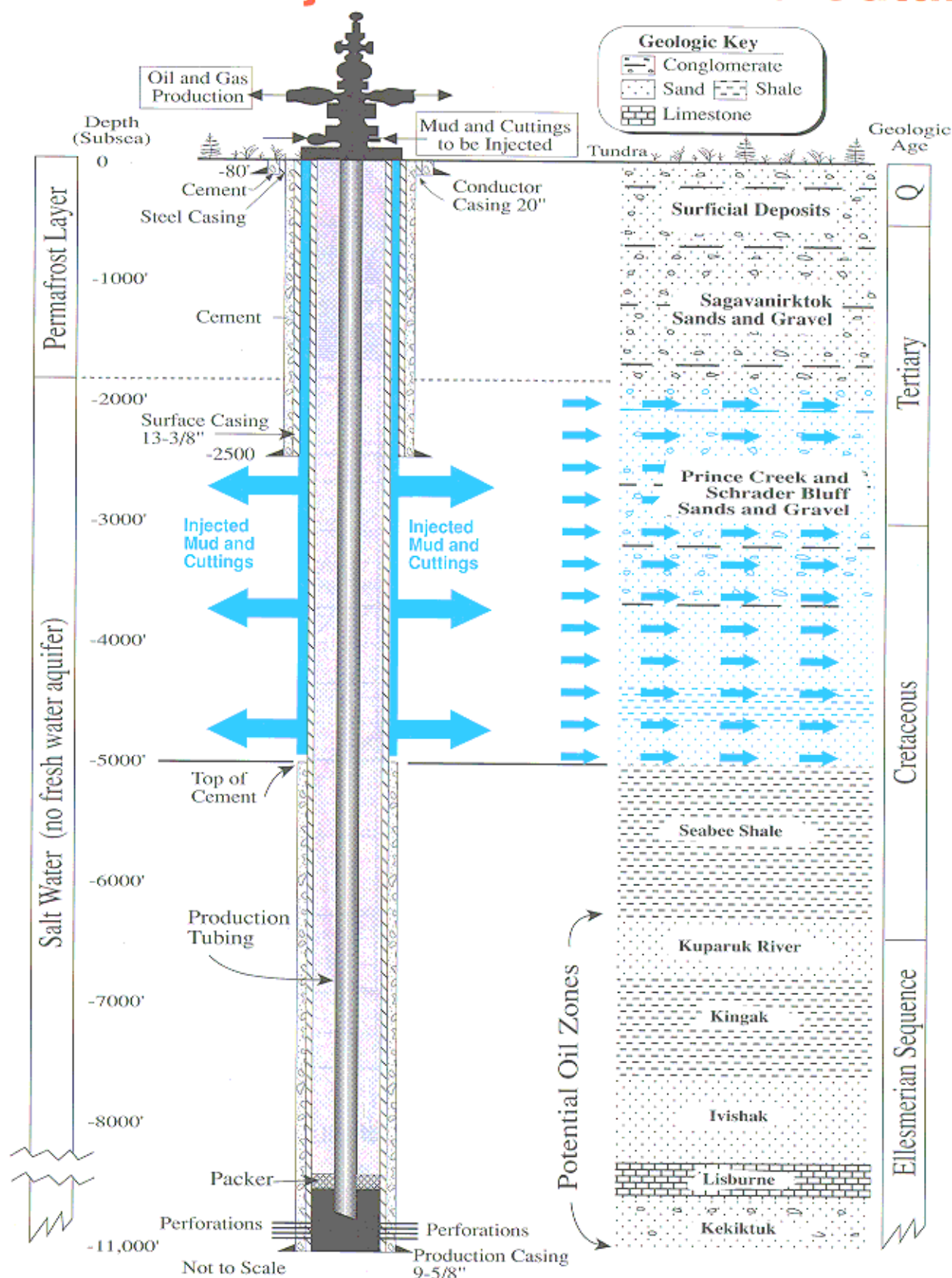
# Mud, Cuttings and Gravel from Well



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# Subsurface Injection of Mud and Cuttings



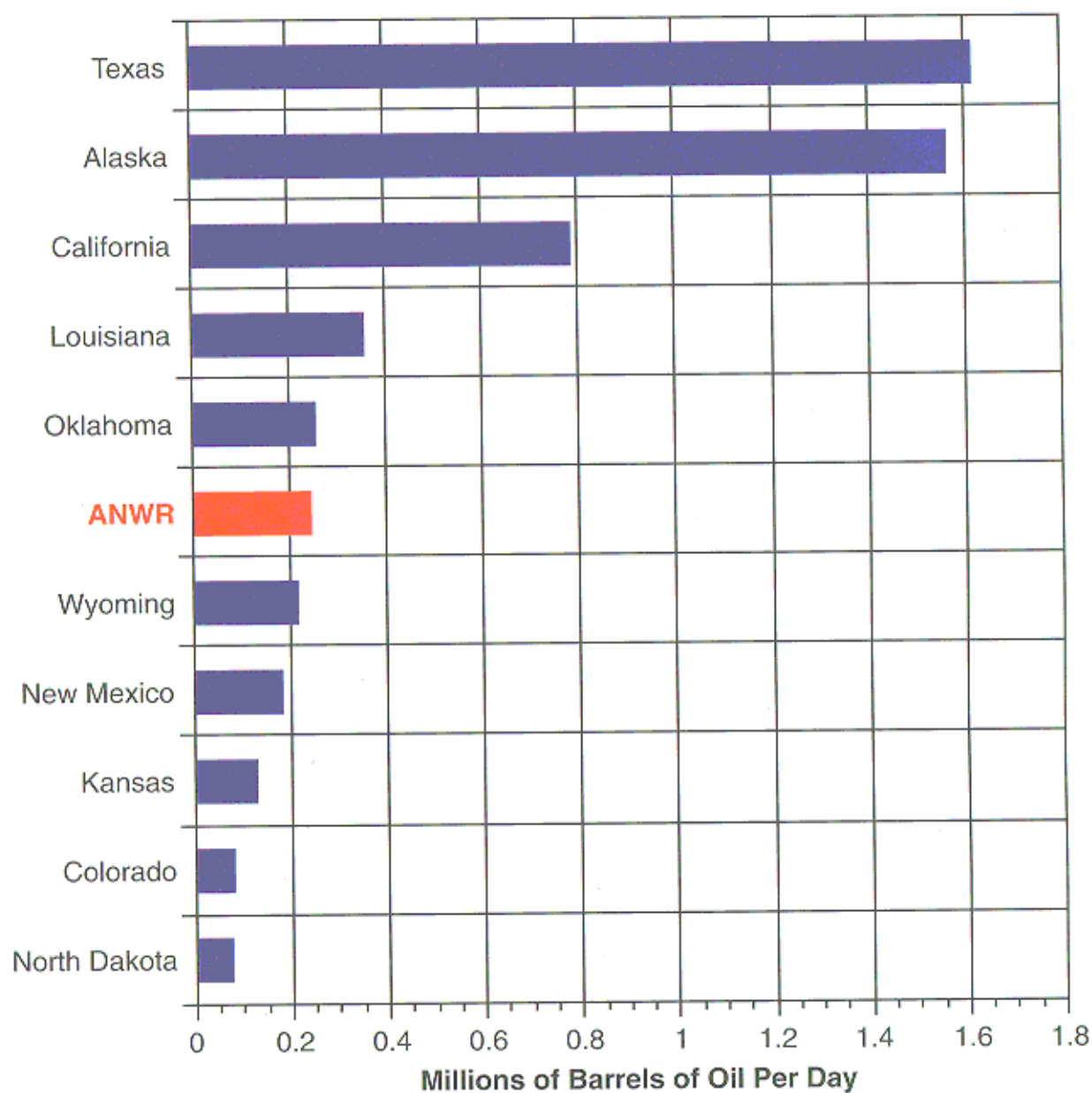
Please Note:

1. When injection phase is completed, the 9-5/8" X 13-3/8" annular space is pumped full of cement and permanently sealed.
2. In the Kuparuk River Unit the surface casing is set through the West Sak interval (to approximately -4000 ss).

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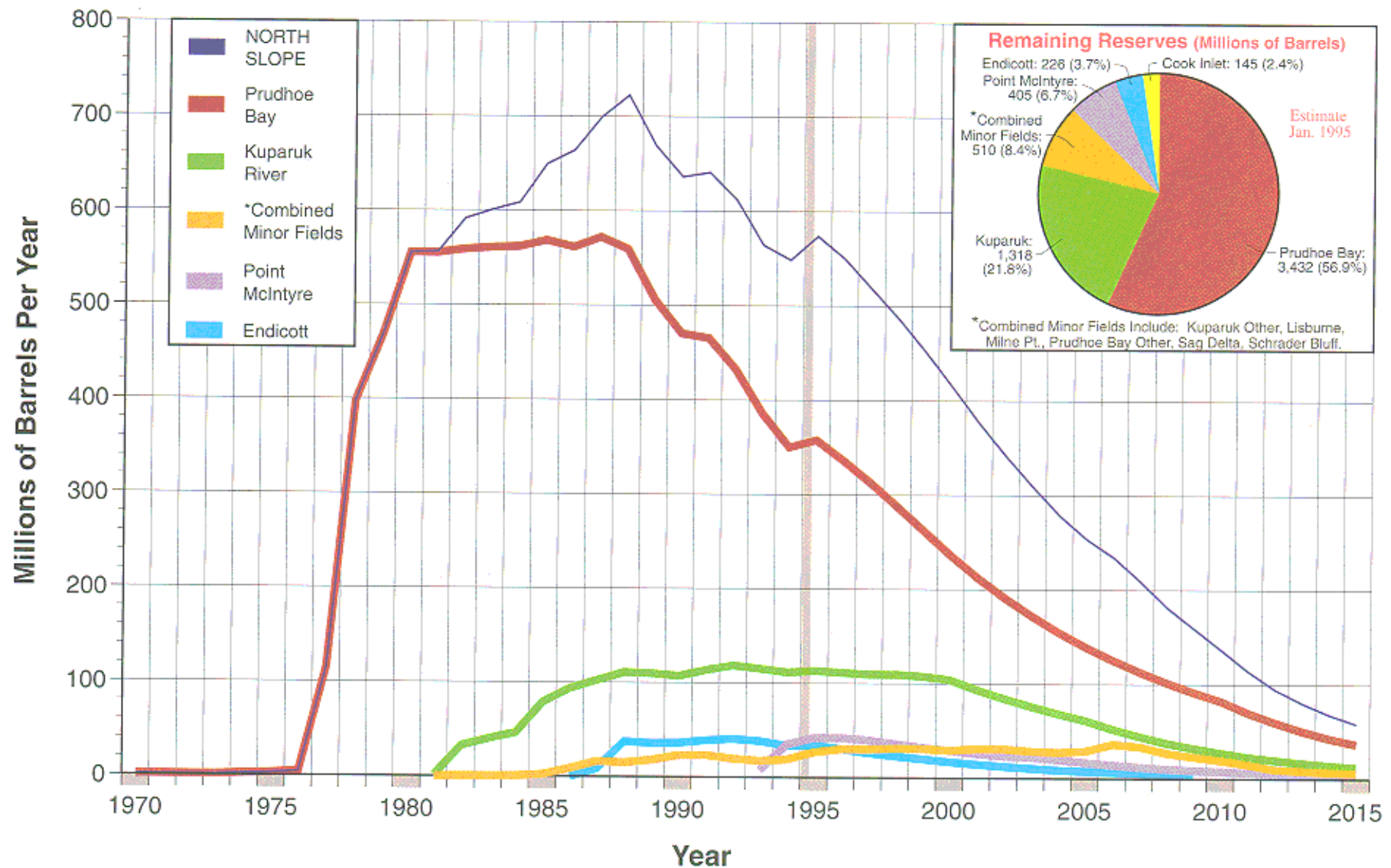


## Production of Crude Oil by Top Ten States & ANWR



Source: Petroleum Supply Monthly, November 1994. DOE Energy Information Administration.  
ANWR figure assumes peak production from mean resource estimate. DOI, 1991

# North Slope Historical & Projected Oil Production



Source: Alaska Dept. of Natural Resources, Div. of Oil & Gas  
Historical & Projected Oil & Gas Consumption, March 1995